#25

INSTRUCTION BOOK

MODEL 1870

INCREMENTAL INDUCTANCE
COMPARISON BRIDGE

FREED TRANSFORMER CO., INC.
INSTRUMENT DIVISION

INSTRUCTION MANUAL

FREED TRANSFORMER CO., INC.
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MP MASTER
MA34269

INSTRUCTION BOOK

MODEL 1870

INCREMENTAL INDUCTANCE COMPARISON BRIDGE

FREED TRANSFORMER CO., INC.
INSTRUMENT DIVISION

FREED TYPE 1870
INCREMENTAL INDUCTANCE COMPARISON BRIDGE

THE FREED TYPE 1870 IS DESIGNED FOR RAPID PRODUCTION TESTING OF TRANSFORMERS AND CHOKES UNDER ACTUAL OPERATING CONDITIONS. THE UNIT CONSISTS OF A 0-500 MA VARIABLE DC SUPPLY, AN 0-135 VOLT VARIABLE 60 CYCLE SUPPLY, A COMPARISON CIRCUIT AND A VACUUM TUBE VOLTMETER. SEE FIG. 1

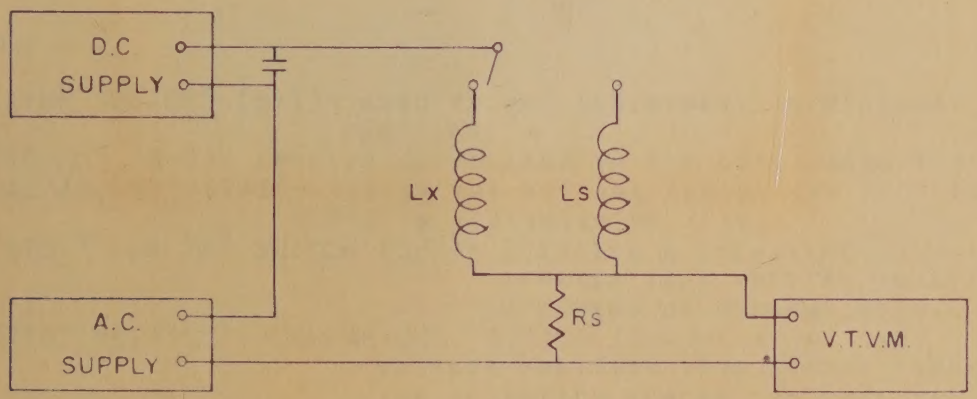


FIG. # 1

THE METHOD OF TESTING IS TO COMPARE AN UNKNOWN INDUCTOR AGAINST A STANDARD OF THE SAME TYPE. BOTH THE DC CURRENT AND AC TEST VOLTAGE ARE SWITCHED BY A FRONT PANEL SWITCH OR A FOOTSWITCH, FROM THE STANDARD TO THE UNKNOWN, AND THE PERCENT DIFFERENCE BETWEEN THE TWO IS INDICATED DIRECTLY ON A FOUR INCH METER.

FOR PRODUCTION TESTING THE INSTRUMENT MAY BE USED AS A HIGH SPEED LIMIT BRIDGE.

SPECIFICATIONS

INDUCTANCE RANGE: 25MH TO 100H
DEVIATION RANGE: ±20% WITH AN ACCURACY OF ±1% AND50%
WITH AN ACCURACY OF 5%;
FREQUENCY: THE LINE FREQUENCY IS USED FOR MOST MEASUREMENTS AND A VARIABLE 60 CYCLE SUPPLY IS INCORPORATED IN THE UNIT. TO TEST COMPONENTS AT ANY OTHER FREQUENCY SIMPLY CONNECT AN EXTERNAL OSCILLATOR TO THE JACK PROVIDED. FREQUENCY RANGE 60CPS TO 10,000CPS.
VOLTAGE APPLIED TO THE UNKNOWN: VARIABLE FROM 0TO 135 VOLTS.
DC CURRENT RANGE: 0-500MA IN FOUR OVERLAPPING RANGES.
0-5MA, 0-25MA., 0-100MA. AND 0-500MA.
VACUUM TUBE VOLTMETER: .01, .1, 1 10 AND 100 VOLTS
2/3 FULL SCALE.
POWER SUPPLY: THE INSTRUMENT IS ENTIRELY SELF CONTAINED, AND OPERATES ON 100-125 VOLTS 50-60CYCLES.
DIMENSIONS: 19 1/2" x 22" x15" HIGH.

CONTROLS

1. "LINE SWITCH" (S-1)- USED TO PUT INSTRUMENT IN STAND-BY POSITION.
2. "AC ON" (S-2)- APPLIES AC VOLTAGE TO THE COIL UNDER TEST.
3. "AC ADJUST" (T-1)- VARIES THE VOLTAGE ACROSS THE TEST COIL; T-2 IS A VERNIER ON THIS.
4. "STD." AND "X" SWITCH (S-3)- ACTUATES A RELAY (RL-1) WHICH APPLIES TEST VOLTAGE TO EITHER THE STANDARD OR UNKNOWN COIL.
5. "TEST VOLTAGE"-"COMPARISON" SWITCH (S-5)- IN THE TEST VOLTAGE POSITION THIS SWITCH CONNECTS THE VOLTMETER ACROSS THE COIL AND IN THE "COMPARISON" POSITION THE VOLTMETER IS ACROSS A STANDARD RESISTOR ACROSS WHICH THE % DEVIATION IS MEASURED.
6. "L MULTIPLIER" (S-4)- THIS SWITCH CONTROLS THE VALUE OF RESISTOR IN SERIES WITH THE COIL UNDER TEST.
7. "DC ON" SWITCH (S-6)- APPLIES DC CURRENT TO COIL UNDER TEST.
8. "DC ADJUST"(T-6) -VARIES DC CURRENT THROUGH TEST COIL. T-7 IS THE FINE ADJUSTMENT.
9. "DC RANGE" SWITCH(S-7)- CHANGES RANGE OF DC METER AND DC CURRENT OUTPUT.
10. "AC VOLTS" (S-8)- VOLTMETER RANGE SWITCH.
11. "SCALE ADJUST"(R-8)- ADJUST LEVEL OF VTVM WHEN IN COMPARISON POSITION.

OPERATING INSTRUCTIONS

1. Turn the power switch (S-3) to "on". Allow several minutes for AC voltmeter and DC power supply filaments to warm up.

2. Connect the standard coil across terminal marked "std." and the coil to be tested across the "X" terminals.

3. Set the "L multiplier" switch so that the series resistance across which the comparison voltage will be measured is 10% or less than the impedance of the coils to be tested.

L multiplier	Series resistance	Inductance range
1	1 ohms	25mh to 250mh
2	10 ohms	250mh to 1 h
3	50 ohms	1h to 2.5h
4	100 ohms	2.5h to 10h
5	500 ohms	10h to 25h
6	1000 ohms	above 100h

The inductance range is for 60 cycles at other test frequencies. WL must be calculated. There is considerable overlap on these settings so that for any inductor being measured two or more multiplier setting may be used. This is discussed in detail under section 6. The source impedance of the AC Supply is approximately 150 ohms so that small inductors should be measured at higher frequencies to prevent the oscillator from being loaded. When impedances below 250 ohms are compared errors will result due to this loading effect when deviations greater than 5% are measured. For small deviations no error results since the generator sees a constant load.

4. Switch (S-3) to "std." position, put S-5 on "test voltage" position and throw AC switch on. Then adjust AC volts until desired test voltage as indicated on VTVM, is across the test coil.

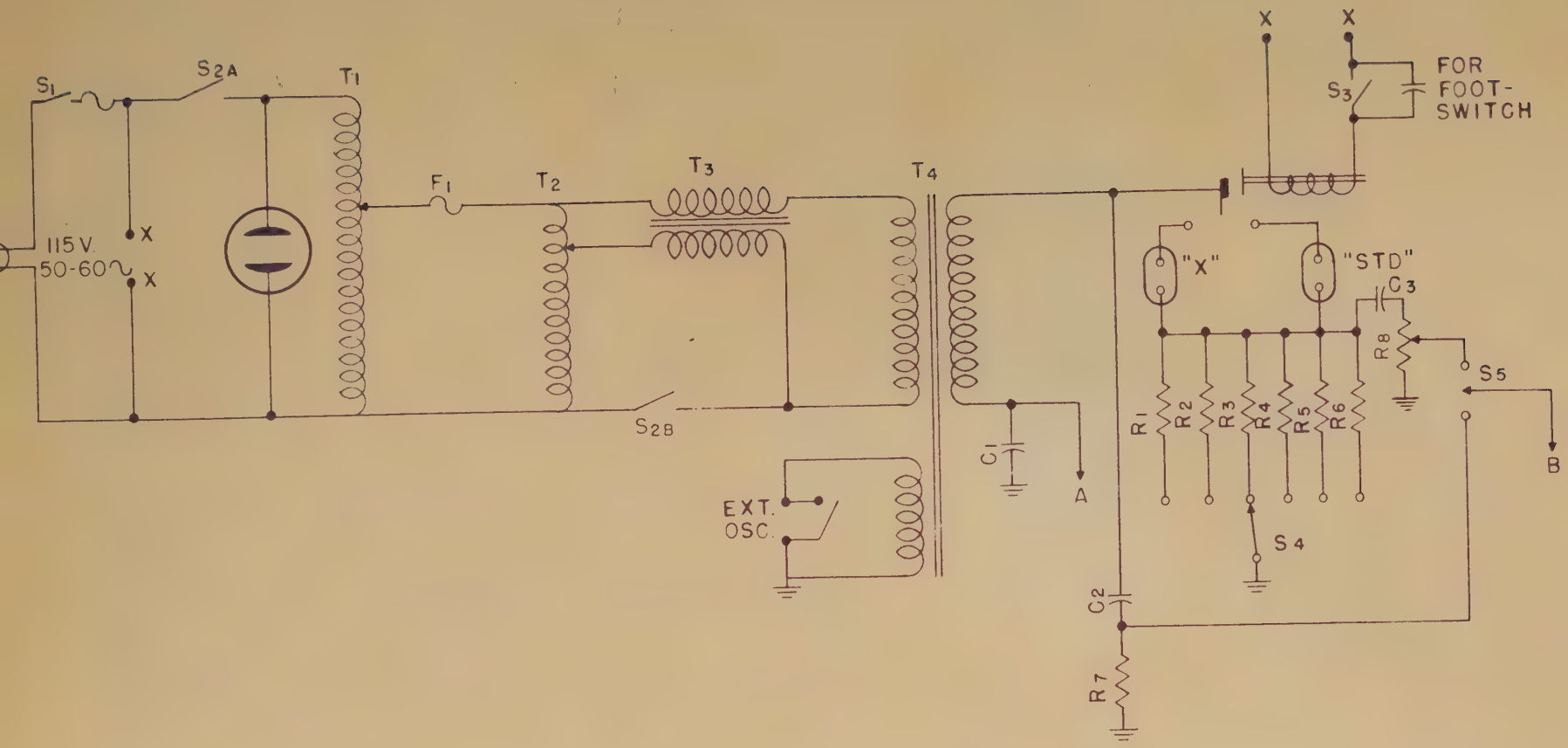
5. Switch "DC range" (S-7) to proper range and adjust DC current as indicated on meter to value of desired test current.

6. Put (S-5) in comparision position. Then change AC voltmeter range switch so that the meter reads on scale. Adjust the "scale adjust" until the meter reads 0%. After changing "L multiplier" recheck test voltage.

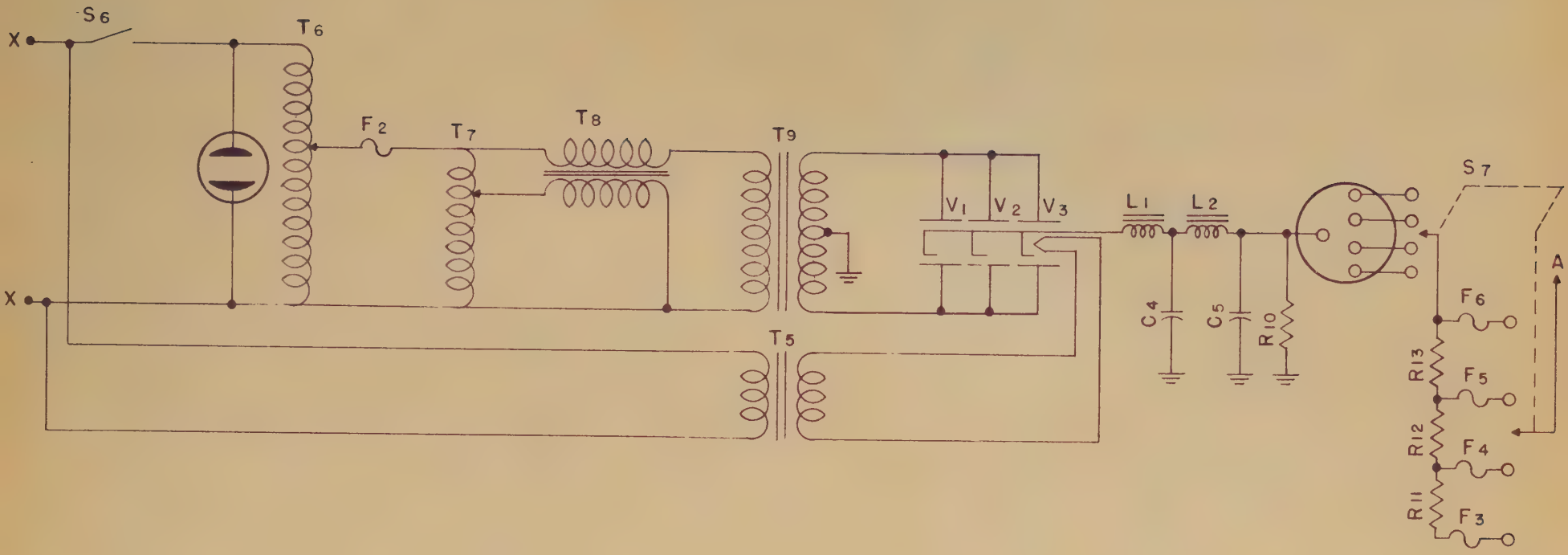
7. Switch (S-3) to "x" and read % difference directly on AC meter scale. For production testing keep (S-3) in the "x" position and connect the coils to be tested across the "x" terminals. To offset the variations in line voltage recheck the 0% level of the meter periodically by switching to "std." position. A footswitch connected to the jack in back of the instrument may be used instead of (S-3).

NOTES:

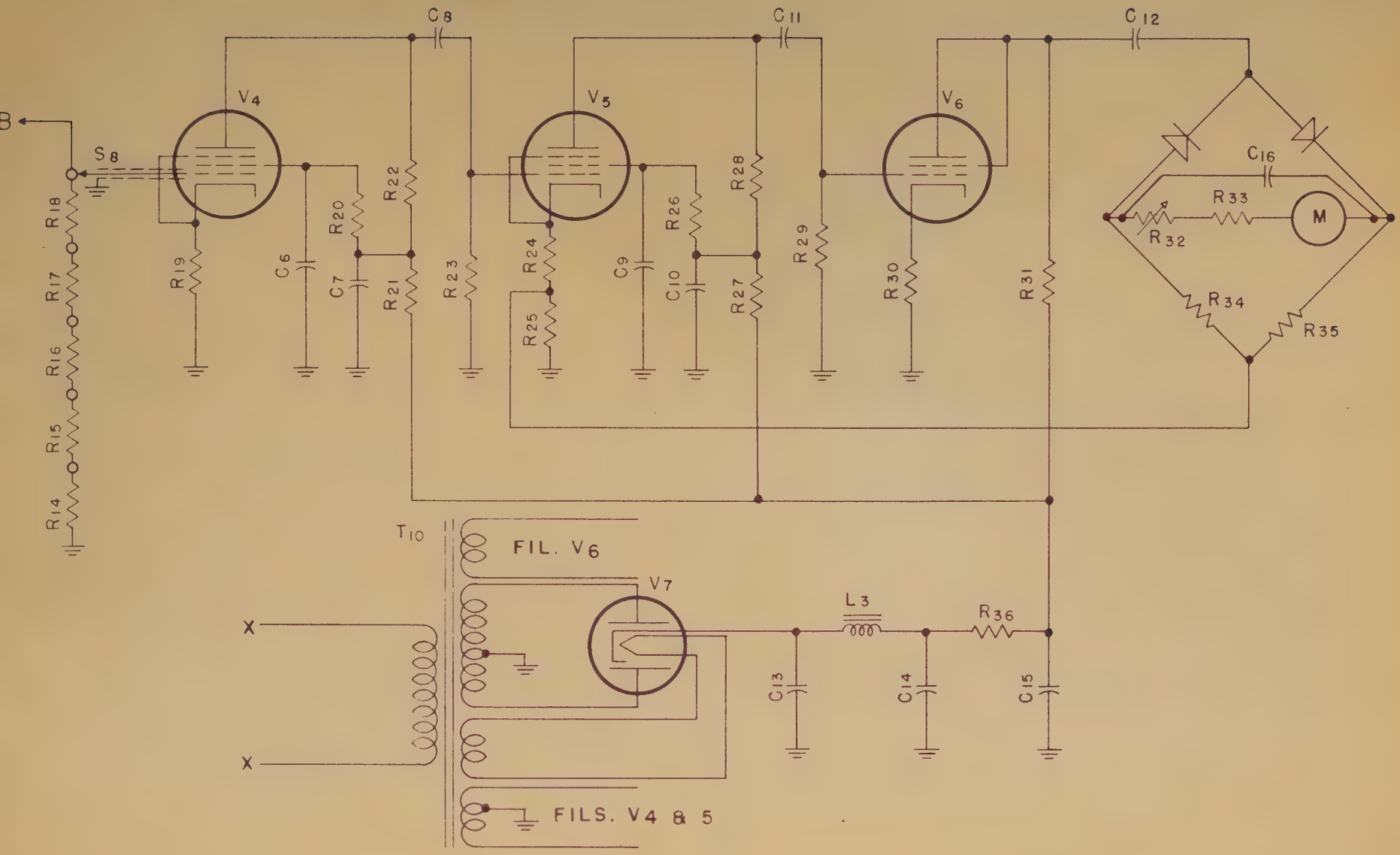
IF OTHER THAN THE LINE FREQUENCY IS USED, INSERT PLUG INTO "OSC INPUT" JACK. CALCULATE WL TO SET PROPER "L MULTIPLIER" (SERIES RESISTANCE SHOULD BE ABOUT 10% OF WL) AND PROCEED AS ABOVE. DUE TO 60 CYCLE, PICKUP ERRORS MAY BE ENCOUNTED IF INSTRUMENT IS IMPROPERLY GROUNDED. TO MINIMIZE THIS EFFECT AVOID USE OF .01 VOLTMETER RANGE WHEN USING EXTERNAL OSCILLATOR, AND KEEP AC SWITCH IN OFF POSITION, FOR SOME APPLICATONS WHERE LOW IMPEDANCE TEST COILS ARE USED AND HIGH TEST VOLTAGE ARE DESIRED A POWER AMPLIFIER MAY BE REQUIRED BETWEEN THE OSCILLATOR AND THE 1870.



AC SUPPLY FOR
FREED MODEL 1870



DC SUPPLY FOR
FREED MODEL 1870



VTVM FOR
FREED MODEL 1870

PARTS LIST

RESISTORS

R-1	1 OHM	1w	±10%
R-2	10 OHMS	10w	±5%
R-3	50 OHMS	50w	±5%
R-4	100 OHMS	100w	±5%
R-5	500 OHMS	100w	±5%
R-6	1000 OHMS	100w	±5%
R-7	10 MEG	1/2w	±10%
R-8	250K	2w	POTENTIOMETER
R-10	4K	100w	±10%
R-11	50K	4w	±10%
R-12	10K	10w	±10%
R-13	2.5K	50w	±10%
R-14	50 OHMS	1w	±1%
R-15	450 OHMS	1w	±1%
R-16	4.5K1	1w	±1%
R-17	45K	1w	±1%
R-18	450K	1w	±1%
R-19	470 OHMS	1/2w	±10%
R-20	220K	1w	±10%
R-21	4.7K	1/2w	±10%
R-22	47K	1w	±10%
R-23	270K	1/2w	±10%
R-24	330 OHMS	1/2w	±10%
R-25	100 OHMS	1/2w	±10%
R-26	220K	1w	±10%
R-27	4.7K	1/2w	±10%
R-28	47K	1w	±10%
R-29	470K	1/2w	±10%
R-30	500 OHMS	1w	±10%
R-31	25K	10w	±10%
R-32	10K	2w	POTENTIOMETER
R-33	13K	2w	±10%
R-34	10K	2w	±10%
R-35	10K	2w	±10%
R-36	2K	5w	±10%

CAPACITORS

C-1	8 MFD	ELECTROLYTIC	450 VOLTS
C-2	.1 MFD	PAPER	400 VOLTS
C-3	.1 MFD	PAPER	400 VOLTS
C-4	10 MFD	PAPER	600 VOLTS
C-5	10 MFD	PAPER	600 VOLTS
C-6-7	10-40 MFD	ELECTROLYTIC	450 VOLTS
C-8	.1 MFD	PAPER	400 VOLTS
C-9-10	10-10 MFD	ELECTROLYTIC	450 VOLTS
C-11	.1 MFD	PAPER	450 VOLTS
C-12	2 MFD	BATHTUB	600 VOLTS
C-13-14-15	15-15-30 MFD	ELECTROLYTIC	450 VOLTS
C-16	25 MFD	ELECTROLYTIC	25 VOLTS

INDUCTORS

L-1	FILTER CHOKE FREED # 15467
L-2	FILTER CHOKE FREED # 15467
L-3	FILTER CHOKE FREED # F-609

TRANSFORMERS

T-1	VARIABLE AUTO TRANSFORMER
T-2	VARIABLE AUTO TRANSFORMER
T-3	CONTROL TRANSFORMER FREED # TF-19
T-4	ISOLATION AND INPUT TRANSFORMER FREED # 26525
T-5	FILAMENT TRANSFORMER FREED # F-216
T-6	VARIABLE AUTO TRANSFORMER
T-7	VARIABLE AUTO TRANSFORMER
T-8	CONTROL TRANSFORMER FREED # TF-19
T-9	POWER TRANSFORMER FREED # 17029
T-10	POWER TRANSFORMER FREED # 23791

FUSES

F-1	2 AMP FUSE
F-2	3 AMP FUSE
F-3	1/100 AMP FUSE
F-4	1/16 AMP FUSE
F-5	2/10 AMP FUSE
F-6	6/10 AMP FUSE

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